

Amendments to the Claims

Claims 1-7 (cancelled).

8. (Currently amended) A method of cleaning a surface of a copper-containing material, comprising:

forming a copper-containing material over a semiconductor substrate;

forming a second first insulative material over the copper-containing material;

forming a second insulative material over the first insulative material, the first and second insulative materials having an interface therebetween;

etching an opening through the first insulative material and the second insulative material to expose a surface of the copper-containing material at the base of the opening; and

exposing the surface of the copper-containing material to a cleaning solution formed from hydrochloric acid, nitric acid and hydrofluoric acid, the exposing removing less than 5 Angstroms of the first and second insulative materials material from sidewalls of the opening without forming a divot at the interface.

9. (Original) The method of claim 8 wherein the cleaning solution consists essentially of Cl⁻, NO₃⁻, F⁻ and equilibrium components of H₃O⁺ and H₂O, at least until the exposing.

10. (Original) The method of claim 8 wherein the mixture is an aqueous mixture and wherein the only non-hydroxide anions in the cleaning solution consist essentially of Cl⁻, NO₃⁻ and F⁻, at least until the exposing.

11. (Original) The method of claim 8 further comprising, before the exposing, forming the cleaning solution by combining an HCl solution (36%, by weight in water), an HF solution (49%, by weight in water), an HNO₃ solution (70%, by weight in water) and H₂O; the relative amounts of the combined H₂O and solutions being:

from about 2.5 parts H₂O per 1 part HCl solution to about 10 parts H₂O per 1 part HCl solution;

from about 75 parts H₂O per 1 part HNO₃ solution to about 300 parts H₂O per 1 part HNO₃ solution; and

from about 150 parts H₂O per 1 part HF solution to about 600 parts H₂O per 1 part HF solution.

12. (Original) The method of claim 8 further comprising, before the exposing, forming the cleaning solution by combining H₂O with solutions of HCl (36%, by weight in water), HF (49%, by weight in water) and HNO₃ (70%, by weight in water); the relative amounts of the combined H₂O and solutions being about 300 parts H₂O; about 60 parts of the HCl solution; about 2 parts of the HNO₃ solution; and about 1 part of the HF solution.

13. (Original) The method of claim 8 wherein the exposing removes one or more of a copper oxide and a copper fluoride from on the surface.

Claims 14-19 (cancelled).

20. (Previously presented) A semiconductor processing method of forming an opening to a copper-containing substrate, comprising:

providing a copper-containing substrate having a mass thereover, the mass comprising a layer of silicon nitride interfacing a layer of silicon oxide, the copper-containing substrate being supported by a semiconductor material;

etching an opening through the mass and to the copper-containing substrate, a surface of the copper-containing substrate forming a base of the opening and thus defining a base surface of the opening, said base surface being at least partially covered by at least one of a copper oxide, a silicon oxide or a copper fluoride, the opening having sidewalls comprising silicon oxide, silicon nitride and an interface between the silicon oxide and the silicon nitride; and

cleaning said base surface with a cleaning solution formed from hydrochloric acid, nitric acid and hydrofluoric acid to remove at least some of the at least one of a copper oxide, a silicon oxide or a copper fluoride from the base surface, the cleaning removing a thickness of less than 5 angstroms of silicon oxide from the sidewalls without formation of a divot at the interface.

21. (Cancelled)

22. (Original) The method of claim 20 wherein the base surface is at least partially covered by copper oxide, silicon oxide and copper fluoride; and wherein the

cleaning removes substantially all of the copper oxide, silicon oxide and copper fluoride from the base surface of the copper-containing substrate.

23. (Original) The method of claim 20 wherein the copper-containing substrate consists essentially of elemental copper.

24. (Original) The method of claim 20 wherein the cleaning solution consists essentially of Cl⁻, NO₃⁻, F⁻ and equilibrium forms of H₃O⁺ and H₂O, at least until the exposing.

25. (Original) The method of claim 20 wherein the mixture is an aqueous mixture and wherein the only non-hydroxide anions in the cleaning solution consist essentially of Cl⁻, NO₃⁻ and F⁻, at least until the exposing.

26. (Original) The method of claim 20 further comprising, before the exposing, forming the cleaning solution by combining an HCl solution (36%, by weight in water), an HF solution (49%, by weight in water), an HNO₃ solution (70%, by weight in water) and H₂O; the relative amounts of the combined solutions and H₂O being:

from about 2.5 parts H₂O per 1 part HCl solution to about 10 parts H₂O per 1 part HCl solution;

from about 75 parts H₂O per 1 part HNO₃ solution to about 300 parts H₂O per 1 part HNO₃ solution; and

from about 150 parts H₂O per 1 part HF solution to about 600 parts H₂O per 1 part HF solution.